July 19, 1966 E. J. HUNTER 3,261,552

DUAL SPEED SPRINKLER

Filed Jan. 6, 1964

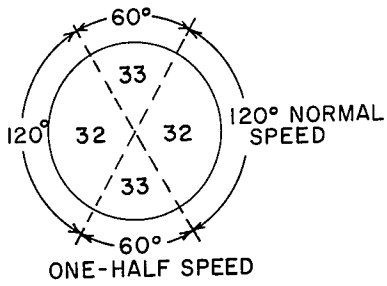


FIG. 1

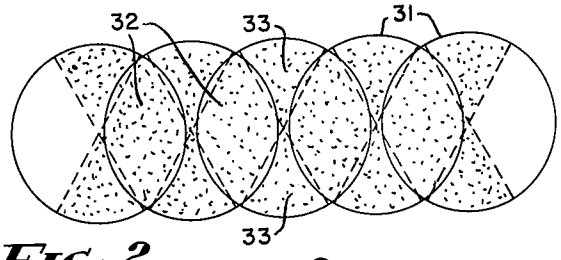


FIG. 2

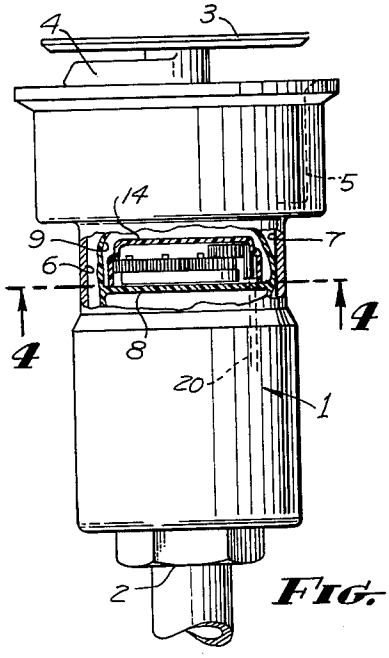


FIG. 3

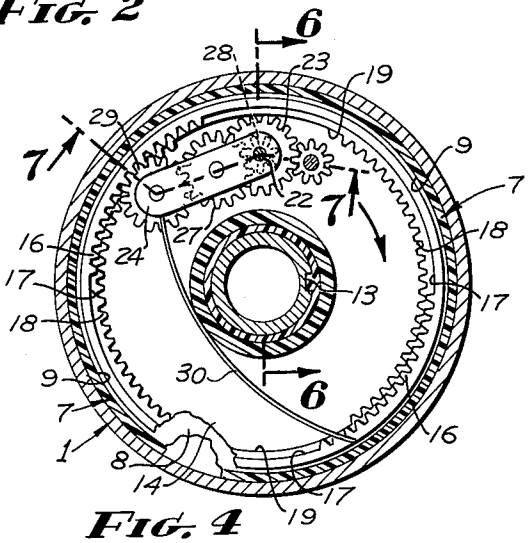


FIG. 4

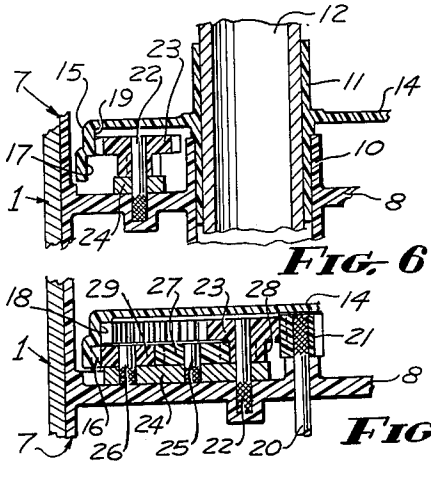


FIG. 6

FIG. 7

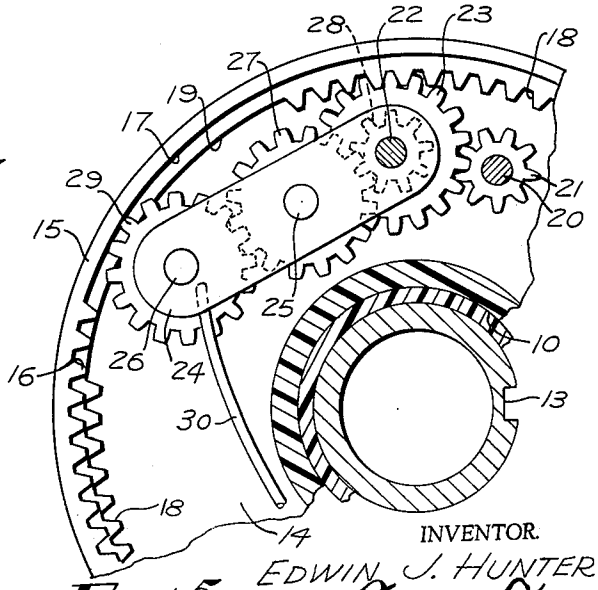


FIG. 5

INVENTOR.
EDWIN J. HUNTER
BY Lyon & Lyon
ATTORNEYS

United States Patent Office

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DUAL SPEED SPRINKLER

Edwin James Hunter, Riverside, Calif., assignor to Moist O'Matic, Inc., Riverside, Calif., a corporation of Minnesota

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This invention relates to dual speed sprinklers and included in the objects of this invention are:

First, to provide a sprinkler having a rotating nozzle which, during predetermined portions of each revolution, turns at a normal speed, and, during predetermined other portions, turns at half its normal speed or at some other predetermined speed.

Second, to provide a sprinkler, a series or row of which may be arranged so that the sprinkling circles of alternate sprinklers are essentially tangential and approximately 120° sectors of the sprinkling areas overlap leaving 60° sectors which are not overlapped, the sprinklers being caused to turn at normal speed throughout the 120° sectors and at half speed throughout the 60° sectors so as to water uniformly the total area between the first and last sprinkler of the row.

Third, to provide a dual speed mechanism for sprinklers which may be adapted to the motors of various types of rotating sprinklers, but which is especially adapted for incorporation in the sprinkler and motor drive disclosed in Patent No. 3,107,056, issued October 15, 1963, entitled "Sprinkler."

Fourth, to provide a dual speed mechanism for sprinklers having two speed change gears wherein one of the speed change gears is yieldable when both change gears are simultaneously in engagement, so that one gear may engage its mating drive gear before the other disengages thereby to maintain a positive drive.

With the above and other objects in view, reference is directed to the accompanying drawings, in which:

FIGURE 1 illustrates, diagrammatically, selected sectors of a circle wherein the sprinkler may move at normal speed and at half speed during a rotation cycle.

FIGURE 2 illustrates diagrammatically a row of dual speed sprinklers arranged to take advantage of the rotation cycle shown in FIGURE 1.

FIGURE 3 is a side view of a sprinkler of the type shown in the hereinbefore mentioned patent which is modified in accordance with the present invention to produce a dual speed cycle.

FIGURE 4 is an enlarged transverse sectional view thereof directed upward and taken through 4—4 of FIGURE 3, showing the dual speed drive in the course of its half speed operation.

FIGURE 5 is a further enlarged fragmentary sectional view in the plane of FIGURE 4, omitting the surrounding water case and showing the dual speed drive in the course of its normal speed operation and just prior to termination thereof.

FIGURE 6 is a further enlarged fragmentary sectional view taken through 6—6 of FIGURE 4.

FIGURE 7 is a further enlarged fragmentary sectional view taken through 7—7 of FIGURE 4.

The dual speed sprinkler may be incorporated in various types of sprinkler structures, for example the sprinkler disclosed in the aforementioned Patent No. 3,107,056. Said sprinkler structure, illustrated in part herein, includes a housing 1 having an inlet 2 at its lower end and a cap 3 at its upper end supported by a sprinkler head 4 which is capable of limited extension and retraction. When retracted the sprinkler head is enclosed within a sprinkler head compartment 5 formed within the housing. Below the sprinkler head compartment the housing forms a motor compartment 6 which receives a motor

shell 7 having a turbine drive and gear reduction means more fully disclosed in the aforementioned patent. The motor shell is provided with a partition 8 forming the lower side of a sealed drive compartment 9. Centered in the drive compartment is a tubular sleeve 10 which journals a tubular bearing 11; slideably mounted in the tubular bearing is a tubular stem 12, the upper end of which is connected to the sprinkler head 4 and the lower end of which communicates with the inlet 2. The structure so far described is common to the structure illustrated in the hereinbefore mentioned patent and is more fully described in said patent. In order to provide a drive connection between the bearing 11 and the stem 12 the confronting walls of the bearing and stem are provided with key means 13.

In the exercise of the present invention the tubular bearing 11 is provided midway between its ends with a radial flange 14 terminating in a downwardly directed cylindrical skirt 15. At its lower extremity the skirt is provided internally with a pair of diametrically disposed internal gear segments 16 separated circumferentially by arcuate blind segments 17 without gear teeth. The portion of the skirt 15 adjacent to the flange 14 is slightly smaller in diameter than its extended portion and is provided with a pair of diametrically disposed minor gear segments 18 separated circumferentially by minor blind segments 19.

Extending upwardly through the partition 8 is a motor drive shaft 20 operated by the turbine and gear reduction unit disclosed in the aforementioned patent. Within the drive compartment the shaft 20 is provided with a drive pinion 21. The shaft and drive pinion is located near the skirt 15 but clears the gear segments. Supported in the partition 8 and disposed circumferentially from the drive shaft 20 is a spindle shaft 22 which receives a normal speed drive gear 23 engageable with the minor gear segment 18.

Pivoted on the main counter shaft adjacent the partition 8 is a gear supporting strip 24 having an upwardly extending idler gear shaft 25 and an upwardly extending half speed gear shaft 26. An idler gear 27 is mounted on the idler gear shaft 25 and is engaged by a pinion gear 28 mounted on the main counter shaft 22 and integral with the normal speed drive gear 23. The idler gear 27 engages a half speed gear 29 mounted on the shaft 26 and adapted to engage the major gear segments 16. The half speed gear 29 is disposed at the free end of the supporting strip 24 and a leaf spring 30 is provided for the purpose of exerting a radially outward force so that half speed gear 29 is held in yieldable engagement with the major gear segments 16.

The major and minor internal gear segments are so related to each other and to the spacing between the normal speed drive gear 23 and half speed drive gear 29, that immediately before disengagement between a drive gear 23 or 29 and its gear segment, the other drive gear moves into engagement with its gear segment. Were it not for the yieldable connection between the half speed gear 29 and its gear segment the gears would lock. However, the spring 30 allows the half speed drive gear to jump one or two cogs or teeth until the conflicting condition is eliminated. Stated otherwise, when the full speed and half speed gears are simultaneously engaged, the spring 30 renders the half speed gear and the drive means formed thereby inoperative.

Operation of the dual speed sprinkler is as follows:

For purposes of illustration, the dual speed sprinkler is shown as arranged to rotate at normal speed for 120° and then continue at half speed for 60° then resumes normal speed for an additional 120° and then completes its rotation by moving at half speed for the remaining 60° of the circle. During normal speed drive the normal

speed drive gear **23** is in engagement with one of the minor internal gear segments **18** while the half speed drive gear **29** rides on a corresponding major blind segment **17**. As the normal speed drive gear **23** approaches the end of its corresponding gear segment **18**, the half speed drive gear **29** engages a minor gear segment **16** but jumps or skips the first one or two teeth until the normal speed drive gear **23** clears gear segment **18**. Thereupon, the sprinkler rotates at half speed. As the half speed drive gear **29** approaches the end of its corresponding gear segment **16**, the normal speed drive gear **23** engages its gear segment **18** causing the half speed gear to skip the last one or two teeth until clear of its gear segment **16**. The normal speed drive gear upon engagement with its segment **18** returns the sprinkler to its normal rotation speed.

It will be observed that this is accomplished without losing a drive connection between the motor and the sprinkler head and that the sprinkler may resume operation irrespective of where it may stop in its circle of rotation.

If the gear segments are arranged as shown in FIGURES 4 and 5 and indicated diagrammatically in FIGURE 1, then a group of the two speed sprinklers may be arranged in a row so that the sprinkling circles, designated **31**, at alternate sprinklers may be essentially tangential as shown in FIGURE 2. With this arrangement, segmental sprinkling areas **32** having substantially 120° arcs are covered by a pair of adjacent sprinklers; whereas, sprinkling areas having approximately 60° arc, designated **33**, directed laterally from the axis of the row of sprinklers receive water from only one sprinkler. Thus, by rotating the sprinklers at normal speed through the sprinkling areas **32** and at half speed through sprinkling areas **33**, the combined area between the two remote sprinklers is uniformly covered.

It should be observed that one of the minor internal gear segments **18** may be omitted and that the major internal gear segment **16** may be continued so as to cause the end sprinklers shown in FIGURE 2 to rotate at half speed through a 240° arc should this be desired.

It should be noted that while the half speed gear **29** is spring loaded and thus is inoperative in case of conflict with the full speed gear **23**, the positions of these gears may be reversed so that the full speed gear is spring loaded.

It should also be observed that other sprinkler patterns may be employed and that the location and arcuate extent of the internal gear segments may be altered so that the sprinkler rotates at the proper speed to effect uniform distribution in a manner analogous to that illustrated in FIGURE 2. Also, while a 2–1 ratio is preferred for most uses of the dual speed sprinkler other ratios may be adopted should the sprinkling pattern of a group of sprinklers require such change.

While a particular embodiment of the present invention has been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

What is claimed is:

1. A sprinkler comprising:

(a) a sprinkler head adapted for continuous rotation;

(b) a water motor having a rotatable drive shaft;

(c) a normal speed intermittent drive means connecting said drive shaft and sprinkler head for selected arcs of rotation of said sprinkler head;

(d) a slower speed intermittent drive means connecting said drive shaft and sprinkler head for complementary arcs of rotation of said sprinkler head;

(e) said drive means being simultaneously engageable at the beginnings and the ends of said complementary arcs of rotation;

(f) and yieldable means operable to render one of said drive means inoperable upon said simultaneous engagement.

2. A sprinkler comprising:

(a) a sprinkler head adapted for continuous rotation;

(b) a water motor having a rotatable drive shaft;

(c) a normal speed drive means operated by said drive shaft and including a normal speed intermittent gear connected with said sprinkler head, said intermittent gear having diametrically disposed gear segments corresponding to selected arcs of rotation of said sprinkler head;

(d) a slower speed drive means also operated by said drive shaft and including a slower speed intermittent gear having diametrically disposed gear segments corresponding to selected arcs of rotation of said sprinkler head complementary to the first mentioned arcs of rotation thereof;

(e) said drive means being simultaneously engageable at the beginnigs and the ends of said complementary arcs of rotation;

(f) and one of said drive means including a yieldable connection with its intermittent gear to render said drive means inoperative upon said simultaneous engagement.

3. A sprinkler comprising:

(a) a sprinkler head;

(b) a tubular shaft supporting said sprinkler head for continuous rotation;

(c) an internal gear means for driving said shaft and sprinkler head, said internal gear means including a first and a second set of gear segments, the segments of each set being separated by arcuate blank portions;

(d) a first drive means engageable with the first set of gear segments to rotate said sprinkler head at a selected normal speed;

(e) a second drive means engageable with the second set of gear segments to rotate said sprinkler head at a slower speed;

(f) said gear segments being positioned to move said sprinkler head in complementary arcs alternately at normal and slower speeds;

(g) both of said drive means being simultaneously engageable with their respective gear segments at the beginnings and ends of said gear segment;

(h) and yieldable means normally urging one of said drive means into engagement with its internal gear segments and operative to render said drive means inoperative during said simultaneous engagement.

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M. HENSON WOOD, JR., *Primary Examiner.*

EVERETT W. KIRBY, *Examiner.*

D. MOSELEY, *Assistant Examiner.*